

**WHAT IS CLAIMED IS:**

1           1. A system for improving performance of wireless  
2         communications comprising:

3                 a transmitter producing a modulated data signal  
4         combined with one or more supplemental signals on various  
5         frequencies within a monocarrier channel employed to  
6         transmit the modulated data signal; and

7                 a receiver employing the one or more supplemental  
8         signals to compute a frequency domain channel estimate for  
9         use in equalizing the channel during demodulation of the  
10        data signal.

1           2. The system as set forth in Claim 1 wherein the  
2         one or more supplemental signals each employ a different  
3         frequency which changes during each of a plurality of  
4         periods, wherein the time-varying frequency for each  
5         supplemental signal changes from one period to a subsequent  
6         period in a predetermined sequence of frequencies within  
7         the channel.

1           3. The system as set forth in Claim 2 wherein the  
2         predetermined sequence spans frequencies within the channel  
3         to directly provide a frequency domain channel estimate.

1           4. The system as set forth in Claim 2 wherein the  
2 predetermined sequence is coordinated with a field sync  
3 within the modulated data signal.

1           5. The system as set forth in Claim 2 wherein the  
2 one or more supplemental signals are each transmitted with  
3 a power selected to minimize interference with demodulation  
4 of the data signal without reference to the one or more  
5 supplemental signals.

1           6. The system as set forth in Claim 2 wherein the  
2 time varying frequency cycles through all frequencies  
3 within the predetermined sequence at a rate sufficient to  
4 permit multiple channel estimates for a single field of the  
5 modulated data signal.

1           7. The system as set forth in Claim 2 wherein the  
2 predetermined sequence is coordinated with a field sync  
3 within the modulated data signal and wherein the one or  
4 more supplemental signals are each transmitted with a power  
5 selected to minimize interference with demodulation of the  
6 data signal without reference to the one or more  
7 supplemental signals.

1           8. A transmitter for improved wireless communications comprising:

3                 a symbol source producing a data signal;

4                 a waveform generator producing a time-varying  
5                 signal which changes frequency during each of a plurality  
6                 of periods, wherein the frequency changes from one period  
7                 to a subsequent period in a predetermined sequence of  
8                 frequencies within a channel to be employed in transmitting  
9                 the data; and

10                 a modulator producing a transmission signal from  
11                 a combination of the data signal and the time-varying  
12                 signal.

1           9. The transmitter as set forth in Claim 8 wherein  
2                 the predetermined sequence spans the channel to directly  
3                 provide a frequency domain channel estimate.

1           10. The transmitter as set forth in Claim 8 wherein  
2                 the predetermined sequence is coordinated with a field sync  
3                 within the data signal.

1           11. The transmitter as set forth in Claim 8 wherein  
2                 the time-varying signal is transmitted with a power  
3                 selected to minimize interference with demodulation of the  
4                 data signal without reference to the time-varying signal.

1           12. The transmitter as set forth in Claim 8 wherein  
2       the time varying signal cycles through all frequencies  
3       within the predetermined sequence at a rate sufficient to  
4       permit multiple channel estimates for a single field of the  
5       data signal.

1           13. The transmitter as set forth in Claim 8 wherein  
2       the predetermined sequence is coordinated with a field sync  
3       within the data signal and wherein the time-varying signal  
4       is transmitted with a power selected to minimize  
5       interference with demodulation of the data signal without  
6       reference to the time-varying signal.

1           14. The transmitter as set forth in Claim 8 wherein  
2       the time-varying signal is one of a plurality of time-  
3       varying signals each having a different frequency during a  
4       period and each changing frequency from one period to a  
5       subsequent period in the predetermined sequence of  
6       frequencies.

1           15. A receiver for improved wireless communications  
2 comprising:

3                 an equalizer performing channel equalization on a  
4 received signal utilizing a channel estimate; and

5                 a coherent demodulator producing the channel  
6 estimate from the received signal and a time-varying signal  
7 corresponding to a portion of the received signal, wherein  
8 the time-varying signal changes frequency during each of a  
9 plurality of periods, wherein the frequency changes from  
H0 one period to a subsequent period in a predetermined  
H1 sequence of frequencies within a channel on which the  
H2 received signal is received.

1           16. The receiver as set forth in Claim 15 further  
2 comprising:

3                 a waveform generator producing the time varying-  
4 signal, wherein a period duration and the predetermined  
5 sequence match a corresponding period duration and  
6 predetermined sequence employed in generating the received  
7 signal.

1           17. The receiver as set forth in Claim 16 wherein the  
2 waveform generator produces a plurality of time-varying  
3 signals each having a different frequency during a period  
4 and each changing frequency from one period to a subsequent  
5 period in the predetermined sequence of frequencies,  
6 wherein the coherent demodulator produces the channel  
7 estimate from the received signal and each of the time-  
8 varying signals.

1           18. The receiver as set forth in Claim 15 wherein the  
2 predetermined sequence spans frequencies within the channel  
3 to directly provide a frequency domain channel estimate.

1           19. The receiver as set forth in Claim 15 wherein the  
2 predetermined sequence is coordinated with a field sync  
3 within the received signal.

1           20. The receiver as set forth in Claim 15 wherein the  
2 time varying frequency cycles through all frequencies  
3 within the predetermined sequence at a rate sufficient to  
4 permit multiple channel estimates for a single field of the  
5 received signal.

1           21. The receiver as set forth in Claim 15 further  
2 comprising:

3                 a channel estimate post-processor smoothing the  
4 channel estimate, tracking time varying fades within the  
5 channel estimate, and producing Doppler estimates for the  
6 channel estimate.

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

1           22. A method of wireless communication comprising:  
2                 combining a data signal with one or more  
3                 supplemental signals on various frequencies within a  
4                 monocarrier channel; and  
5                 employing the one or more supplemental signals to  
6                 compute a frequency domain channel estimate for use in  
7                 equalizing the channel during demodulation of the data  
8                 signal.

1           23. The method as set forth in Claim 22 wherein the  
2                 step of combining a data signal with one or more  
3                 supplemental signals on various frequencies within a  
4                 monocarrier channel further comprises:

5                 combining the data signal with one or more  
6                 supplemental signals each employing a different frequency  
7                 which changes during each of a plurality of periods,  
8                 wherein the time-varying frequency for each of the supple-  
9                 mental signals changes from one period to a subsequent  
10                 period in a predetermined sequence of frequencies within  
11                 the channel.

1           24. The method as set forth in Claim 23 further  
2 comprising:

3                 periodically changing a frequency for each  
4 supplemental signal in a predetermined sequence spanning  
5 frequencies within the channel to directly provide a  
6 frequency domain channel estimate.

1           25. The method as set forth in Claim 23 further  
2 comprising:

3                 coordinating the predetermined sequence with a  
4 field sync within the data signal.

1           26. The method as set forth in Claim 23 further  
2 comprising:

3                 sweeping each supplemental signal through all  
4 frequencies within the predetermined sequence at a rate  
5 sufficient to permit multiple channel estimates for a  
6 single field of the data signal.

1           27. The method as set forth in Claim 22 further  
2 comprising:

3                 providing each of the supplemental signals with a  
4 power selected to minimize interference with demodulation  
5 of the data signal without reference to the one or more  
6 supplemental signals.

1           28. The method as set forth in Claim 22 further  
2 comprising:

3                 periodically changing a frequency for each  
4 supplemental signal in a predetermined sequence of  
5 frequencies within the channel coordinated with a field  
6 sync within the data signal; and

7                 providing each of the supplemental signals with a  
8 power selected to minimize interference with demodulation  
9 of the data signal without reference to the one or more  
E0 supplemental signals.

1           29. A method for improved wireless communications  
2 comprising:

3                   producing a data signal;  
4                   producing a time-varying signal which changes  
5 frequency during each of a plurality of periods, wherein  
6 the frequency changes from one period to a subsequent  
7 period in a predetermined sequence of frequencies within a  
8 channel to be employed in transmitting the data; and

9                   producing a transmission signal from a  
10 combination of the data signal and the time-varying signal.

11                 30. The method as set forth in Claim 29 wherein the  
12 predetermined sequence spans the channel to directly  
13 provide a frequency domain channel estimate.

14                 31. The method as set forth in Claim 29 wherein the  
15 predetermined sequence is coordinated with a field sync  
16 within the data signal.

17                 32. The method as set forth in Claim 29 wherein the  
18 time-varying signal is provided with a power selected to  
19 minimize interference with demodulation of the data signal  
20 without reference to the time-varying signal.

33. The method as set forth in Claim 29 wherein the time varying signal cycles through all frequencies within the predetermined sequence at a rate sufficient to permit multiple channel estimates for a single field of the data signal.

1           34. The method as set forth in Claim 29 wherein the  
2       predetermined sequence is coordinated with a field sync  
3       within the data signal and wherein the time-varying signal  
4       is transmitted with a power selected to minimize  
5       interference with demodulation of the data signal without  
6       reference to the time-varying signal.

1           35. The method as set forth in Claim 29 wherein the  
2       time-varying signal is one of a plurality of time-varying  
3       signals each having a different frequency during a period  
4       and each changing frequency from one period to a subsequent  
5       period in the predetermined sequence of frequencies.

1           36. A method for improved wireless communications  
2 comprising:

3                 receiving a signal;  
4                 producing the channel estimate from the received  
5                 signal and a time-varying signal corresponding to a portion  
6                 of the received signal, wherein the time-varying signal  
7                 changes frequency during each of a plurality of periods,  
8                 wherein the frequency changes from one period to a  
9                 subsequent period in a predetermined sequence of  
10                 frequencies within a channel on which the received signal  
11                 is received; and

12                 performing channel equalization on the received  
13                 signal utilizing the channel estimate.

14           37. The method as set forth in Claim 36 further  
15 comprising:

16                 producing the time varying-signal with a period  
17                 duration and the predetermined sequence matching a  
18                 corresponding period duration and predetermined sequence  
19                 employed in generating the received signal.

1           38. The method as set forth in Claim 37 further  
2 comprising:

3           producing a plurality of time-varying signals  
4 each having a different frequency during a period and each  
5 changing frequency from one period to a subsequent period  
6 in the predetermined sequence of frequencies, wherein the  
7 channel estimate is produced from the received signal and  
8 each of the time-varying signals.

1           39. The method as set forth in Claim 36 wherein the  
2 predetermined sequence spans frequencies within the channel  
3 to directly provide a frequency domain channel estimate.

1           40. The method as set forth in Claim 36 wherein the  
2 predetermined sequence is coordinated with a field sync  
3 within the received signal.

1           41. The method as set forth in Claim 36 wherein the  
2 time varying frequency cycles through all frequencies  
3 within the predetermined sequence at a rate sufficient to  
4 permit multiple channel estimates for a single field of the  
5 received signal.

1           42. The method as set forth in Claim 36 further  
2 comprising:

3                 smoothing the channel estimate, tracking time  
4 varying fades within the channel estimate, and producing  
5 Doppler estimates for the channel estimate.

1           43. A wireless communication signal comprising:

2                 a data signal; and

3                 at least one supplemental signal combined with  
4         the data signal, the at least one supplemental signal  
5         having a frequency which changes during each of a plurality  
6         of periods in a predetermined sequence of frequencies for a  
7         channel in which the wireless communication signal is  
8         transmitted.

1           44. The wireless communications signal as set forth  
2         in Claim 43 wherein the predetermined sequence of  
3         frequencies spans the channel.

1           45. The wireless communications signal as set forth  
2         in Claim 43 wherein the predetermined sequence is  
3         coordinated with a field sync within the data signal.

1           46. The wireless communications signal as set forth  
2         in Claim 43 wherein at least one supplemental signal sweeps  
3         the predetermined sequence at a rate sufficient to permit  
4         multiple channel estimates based on the at least one  
5         supplemental signal within a single file of the data  
6         signal.

1           47. The wireless communications signal as set forth  
2       in Claim 43 wherein at least one supplemental signal has a  
3       power sufficiently less than a power for the data signal to  
4       permit demodulation of the data signal without reference to  
5       the at least one supplemental signal.

1                  48. The wireless communications signal as set forth  
2        in Claim 43 wherein at least one supplemental signal  
3        further comprises:

a plurality of supplemental signals each having a different frequency during a given period and each changing frequencies in the predetermined sequence from one period to a subsequent period.

49. The wireless communications signal as set forth in Claim 43 wherein wireless communications signal is a result of modulating the combination of the data signal and the at least one supplemental signal.